

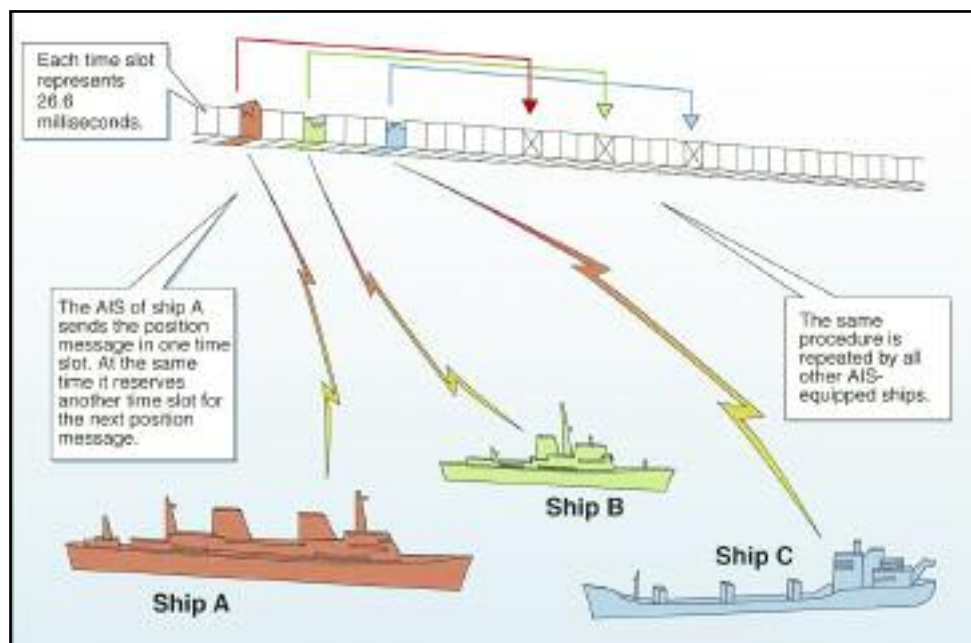
# Automatic Identification System

## *The use of AIS in support of Maritime Domain Awareness.*

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The automatic identification system, or AIS, was developed primarily as a tool for maritime safety with three purposes: to increase vessel-to-vessel situational awareness and aid in collision avoidance, for use by vessel traffic services (VTS), and as a means for coastal states to get information on vessels operating near their coasts. To do this, AIS equipment aboard vessels continuously and autonomously transmits information about the vessel. The Coast Guard has come to see this information as playing a critical role in enhancing Maritime Domain Awareness (MDA). To achieve MDA, the Coast Guard must collect as much information as possible on activities occurring in the maritime domain. Not surprisingly, a large part of this activity relates to the movement of vessels. Therefore detection and identification of vessels is a key component of MDA. The Coast Guard believes that AIS can provide a critical part of vessel-tracking needs to build maritime domain awareness and has several projects in place to gain this capability.

For centuries, vessels have relied upon many tools to improve their situational awareness in order to navigate safely and efficiently. As technology advanced, vessels were able to better see what was around them. Advances in optical devices (the long glass, binoculars, etc.); radar; radio; and other sensors all helped, but establishing the identity and intentions of vessels sensed through these means was still problematic. At the end of the 20th century, the automatic identifica-



**Figure 1: The automatic identification system uses self-organizing time division multiple access to ensure a vessel's AIS transmissions do not interfere with others. Graphic courtesy of the International Association of Lighthouse Authorities & Rolf Backstrom (Finnish Maritime Administration).**

tion system was developed to eliminate the need for a vessel to hail "Unknown vessel off my port bow..." on the radio in order to make passing arrangements.

#### AIS: What it is, How it Works

Sponsored by the International Maritime Organization (IMO) and developed by a variety of international technical bodies, AIS is an international standard for ship-to-ship, ship-to-shore, and shore-to-ship data communication. Through use of sophisticated technology, critical information about a ship (identity, position, course, speed) is processed and transmitted automatically over radio frequencies. The individual transceivers on vessels coordinate autonomously among themselves to ensure that they do not interfere with each other; sending information out in short bursts in assigned time slots (Figure 1).

Automatic identification system data is transmitted at varying rates, depending on the vessels' maneuvering status (Table 1).

This allows for a robust exchange of information that vessels can use in conjunction with other shipboard systems (such as electronic chart plotters or navigation systems and radars) to assist with safe navigation. Additional AIS functionality allows for the transmission of brief text messages for safety-related information and binary applications that hold promise to vastly expand the usefulness of AIS in the world of electronic navigation.

#### Requirements

International requirements and United States' regulations require the carriage of AIS equipment aboard certain vessels.<sup>1</sup> In general, under the international requirements, vessels 300 gross tons or more on international voyages are required to carry and properly operate AIS at all times when underway. In the U.S., the Maritime Transportation Security Act of 2002 included requirements for AIS carriage aboard all commercial self-propelled vessels 65 feet and above in length, most towing vessels, and certain passenger vessels in all navigable waters of the United States, with the provision for some exceptions. For example, some vessels may be exempted from the carriage requirements if it is determined that AIS is not necessary for the safe navigation of the vessel on the waters on which it operates.

U.S. domestic AIS carriage requirements issued by the Coast Guard implement the SOLAS requirements and also expand carriage aboard commercial self-propelled foreign vessels 65 feet and over and

other domestic vessels when operating in VTS areas.<sup>2</sup> Regulations to expand carriage outside vessel traffic services areas are forthcoming and expected to be published before the end of 2007.

TYPE OF SHIP	Reporting Interval
Ship at anchor	3 min.
Ship 0–14 knots	12 sec.
Ship 0–14 knots and changing course	4 sec.
Ship 14–23 knots	6 sec.
Ship 14–23 knots and changing course	2 sec.
Ship >23 knots	3 sec.
Ship >23 knots and changing course	2 sec.

**Table 1: Vessels transmit AIS information (identity, location, course, speed, etc.) at various rates, depending on their maneuvering characteristics.<sup>3</sup>**

Soon into the development of the automatic identification system, it was realized that the information ships would be broadcasting to each other would be very valuable ashore as well. Shore-based navigation information systems and vessel traffic services would get great benefit from real-time ship position and identity as they assisted vessels in busy waterways. Coastal nations also wanted information about passing ships to assist in monitoring activity in sensitive areas for marine resource protection, law enforcement, and maritime security. IMO recognized these potential uses for AIS and endorsed them. This is where the application of the automatic identification system to enhance Maritime Domain Awareness fits in.

#### AIS and MDA

Maritime Domain Awareness, or MDA, is defined as "The effective understanding of anything associated with the global maritime environment that could affect the security, safety, economy, or environment of the United States." Simply stated, Maritime Domain Awareness involves understanding what's going on out on the water. Not surprisingly, a big part of knowing what's happening on the water is knowledge about what vessels are doing. Vessel tracking—detecting, classifying, identifying, and tracking ships—is critical to MDA. Maritime Domain Awareness is not an end unto itself, but rather supports maritime operations, such as navigation safety, maritime security, search and rescue, and law enforcement.





Tower inspection. USCG photo.

AIS is only one of the vessel tracking capabilities used for MDA. The automatic identification system is considered a “cooperative” vessel tracking technology. That is, vessels provide information about themselves through AIS. Therefore, it is subject to unintentional inaccuracies as well as more sinister intentional “spoofing” or dissemination of incorrect information. For this reason, AIS will never be the only MDA vessel-tracking solution. It will be used with other sensors; particularly non-cooperative sensors (such as radar); as well as information from other sources (such as notices of arrival, vessel history, intelligence information, etc.) to make it truly useful for Maritime Domain Awareness.

### Mission Support

While MDA primarily enhances maritime security, its applicability goes far beyond that, to support all

national maritime missions and interests. Traditional Coast Guard missions such as maritime safety, search and rescue, vessel traffic management, and law enforcement will all be served by MDA. Other federal agencies with maritime interests will be supported. For example, the Coast Guard is currently working with the National Oceanic and Atmospheric Administration to use the automatic identification system in support of protection of endangered living marine resources. MDA information will be invaluable to these other agencies and their missions, as it will provide real-time location data on all major cargo and other commercial vessels in the maritime domain.

The Coast Guard already has extensive automatic identification system capability and is acquiring full AIS capability throughout the U.S. maritime domain through the nationwide AIS project. Figure 2 is a snapshot from the Coast Guard common operational picture that displays actual AIS data from these sites.

The wise use of the automatic identification system and development of new AIS capabilities will greatly contribute to future Maritime Domain Awareness and will be a critical part of the evolving world of electronic navigation. More information on the automatic identification system can be found at the U.S. Coast Guard Navigation Center Website (<http://www.navcen.uscg.gov/enav/ais/>) and in AIS publications from IMO, and the International Association of Lighthouse Authorities.

### About the author:

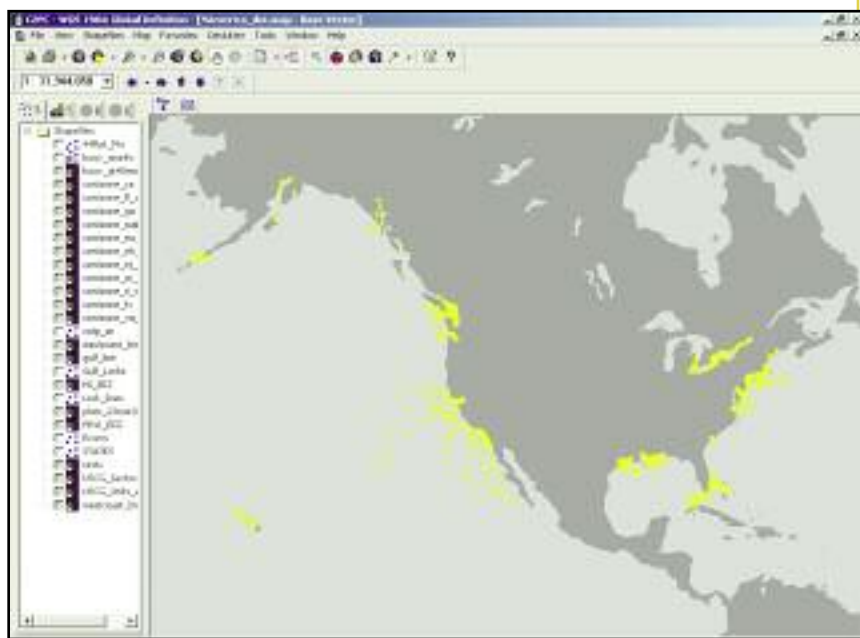
CDR Brian Tetreault has served in the Coast Guard for 19 years, aboard several ships, at vessel traffic services, and on the headquarters and Pacific Area staffs. He graduated from the U.S. Coast Guard Academy in 1987. He holds an Unlimited 2nd Mate license and a 1600 Ton Master license.

### Endnotes

<sup>1</sup> Safety of Life at Sea Convention (SOLAS) Chapter V, Regulation 19.2.4.

<sup>2</sup> Title 33 Code of Federal Regulations (CFR), §164.46.

<sup>3</sup> IMO Resolution MSC.74(69), “Recommendation on performance standards for an universal shipborne automatic identification system (AIS)” p 16.



**Figure 2: Actual AIS data as displayed in the USCG common operational picture. USCG graphic provided by CDR Brian Tetreault.**